

CLAIMS:

1. A capacitor fabrication method comprising:
- forming a first capacitor electrode over a substrate, the first electrode having an inner surface area per unit area and an outer surface area per unit area that are both greater than an outer surface area per unit area of the substrate;
- forming a capacitor dielectric layer over the first electrode; and
- forming a second capacitor electrode over the dielectric layer.
2. The method of claim 1 wherein the first electrode comprises TiN.
3. The method of claim 1 further comprising forming rugged polysilicon over the substrate, the first electrode being over the rugged polysilicon.
4. The method of claim 3 wherein the rugged polysilicon is undoped.
5. The method of claim 3 wherein the rugged polysilicon comprises hemispherical grain polysilicon.

SUB D1 7 6. The method of claim 3 wherein the forming the rugged polysilicon comprises using a seed density sufficiently small to yield at least some spaced apart grains.

7. The method of claim 1 wherein the outer surface area of the first electrode is at least 30% greater than the outer surface area of the substrate.

8. The method of claim 1 wherein the forming the first electrode comprises:

chemisorbing a layer of a first precursor at least one monolayer thick over the substrate;  
chemisorbing a layer of a second precursor at least one monolayer thick on the first precursor layer, a chemisorption product of the first and second precursor layers being comprised by the first electrode.

9. The method of claim 1 wherein the dielectric layer comprises  $\text{Ta}_2\text{O}_5$ ,  $\text{ZrO}_2$ ,  $\text{WO}_3$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{HfO}_2$ , barium strontium titanate, or strontium titanate.

10. A capacitor fabrication method comprising:  
forming an opening in an insulative layer over a substrate; the  
opening having sides and a bottom;  
forming a layer of polysilicon over the sides and bottom of the  
opening;  
removing the polysilicon layer from over the bottom of the  
opening;  
converting at least some of the polysilicon layer to hemispherical  
grain polysilicon;  
conformally forming a first capacitor electrode on the converted  
polysilicon, the first electrode being sufficiently thin that the first  
electrode has an outer surface area per unit area greater than an outer  
surface area per unit area of the substrate underlying the first electrode;  
forming a capacitor dielectric layer on the first electrode; and  
forming a second capacitor electrode over the dielectric layer.

11. The method of claim 10 wherein the hemispherical grain  
polysilicon is undoped.

12. The method of claim 10 wherein the converting the  
polysilicon comprises using a seed density sufficiently small to yield at  
least some spaced apart grains.

1 13. The method of claim 10 wherein the forming the first  
2 electrode comprises:

3 chemisorbing a layer of a first precursor at least one monolayer  
4 thick on the converted polysilicon;

5 chemisorbing a layer of a second precursor at least one monolayer  
6 thick on the first precursor layer; a chemisorption product of the first  
7 and second precursor layers being comprised by the first electrode.

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9 14. The method of claim 10 wherein the first electrode comprises  
10 TiN;

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12 15. The method of claim 10 wherein the dielectric layer  
13 comprises Ta<sub>2</sub>O<sub>5</sub>, ZrO<sub>2</sub>, WO<sub>3</sub>, Al<sub>2</sub>O<sub>3</sub>, HfO<sub>2</sub>, barium strontium titanate, or  
14 strontium titanate.

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16. A capacitor construction comprising:

a first capacitor electrode over a substrate, the first electrode having an inner surface area per unit area and an outer surface area per unit area that are both greater than an outer surface area per unit area of the substrate;

a capacitor dielectric layer over the first electrode; and

a second capacitor electrode over the dielectric layer.

17. The construction of claim 16 wherein the first electrode comprises TiN.

18. The construction of claim 16 further comprising rugged polysilicon over the substrate, the first electrode being over the rugged polysilicon.

19. The construction of claim 18 wherein the rugged polysilicon is undoped.

20. The construction of claim 18 wherein the rugged polysilicon comprises spaced apart grains.

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21. The construction of claim 16 wherein the outer surface area  
of the first electrode is at least 30% greater than the substrate outer  
surface area.

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1 22. A capacitor construction comprising:  
2 an opening in an insulative layer over a substrate, the opening  
3 having sides and a bottom;

4 a hemispherical grain polysilicon layer over the sides of the  
5 opening but not over the bottom;

6 a conformal first capacitor electrode on the polysilicon, the first  
7 electrode being sufficiently thin that the first electrode has a rugged  
8 outer surface with an outer surface area per unit area greater than an  
9 outer surface area per unit area of the substrate underlying the first  
10 electrode;

11 a capacitor dielectric layer on the first electrode; and

12 a second capacitor electrode over the dielectric layer.

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14 23. The construction of claim 22 wherein the polysilicon is  
15 undoped.

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17 24. The construction of claim 22 wherein the polysilicon  
18 comprises spaced apart grains.

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20 25. The construction of claim 22 wherein the first electrode  
21 comprises TiN.  
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